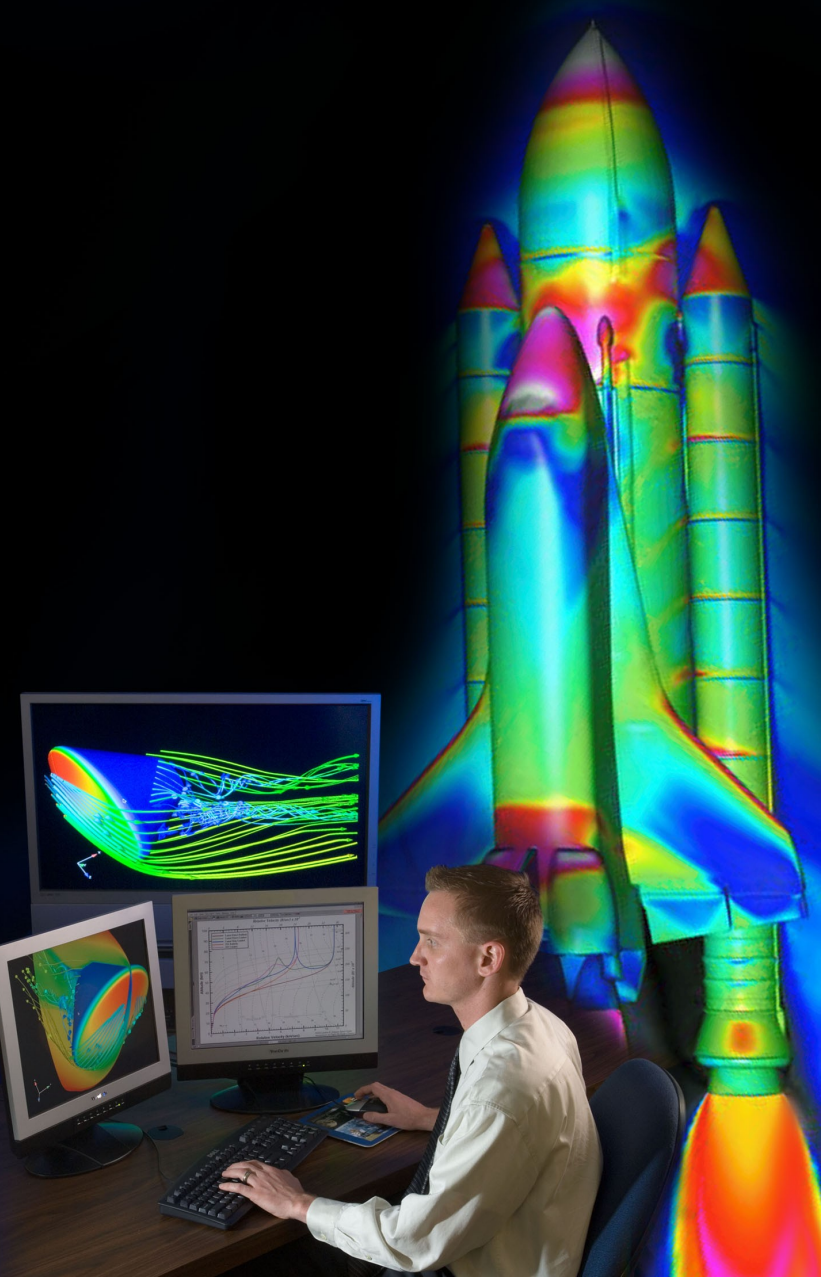
National Aeronautics and
Space Administration

# Aerodynamics

Johnson Space Center (JSC) offers technical leadership in the engineering disciplines of aerodynamics, aerothermodynamics, and fluid dynamics. JSC maintains a highly skilled and experienced workforce, premier laboratories and test facilities, and state-of-the-art analysis tools and databases.

**Services Provided**

- Computational resources to assist in studies of fluid dynamics, aerodynamics, and aerothermodynamics
  - Aerodynamic performance and loads
  - Aerothermal environments
  - On-orbit aerodynamics
  - Plume-induced environments
  - Parachute/flexible structure aerodynamics
  - Computational fluid dynamics
- Ground and flight testing
- Model development
  - Computer-Aided Design (CAD) model generation
  - Computational fluid dynamics grid generation
  - Flowfield visualization
  - Rarified gas dynamics



www.nasa.gov

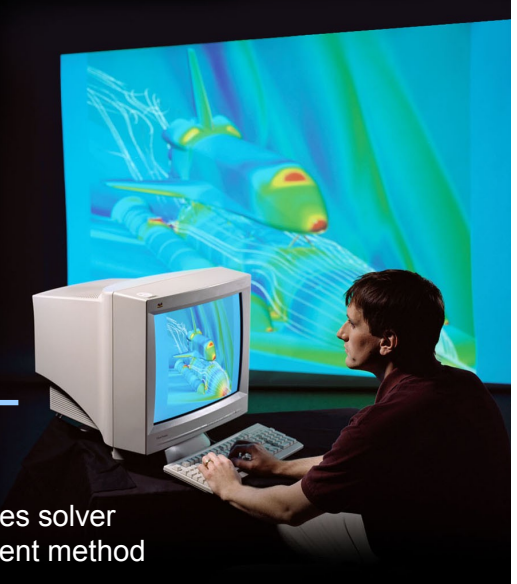
## Aeroscience and Computational Fluid Dynamics Laboratory

The laboratory provides computational resources to assist in studies of fluid dynamics, aerodynamics, and aerothermodynamics. Much of the work in the laboratory involves interactive computer graphics and includes CAD model generation, computational fluid dynamics grid generation, and flowfield visualization. In addition, the computers are configured to provide a parallel-computing environment for large-scale simulations.

## Flight Mechanics Laboratory

The laboratory utilizes a high performance Linux computing cluster along with specially designed software tools in order to solve various flight mechanical disciplines, including

- Performance optimization
- Preliminary guidance design
- Aerothermal analysis
- Ascent design
- Aerodynamic stability
- Parachute deploy through landing dynamics
- Aerobraking and aerocapture
- Entry trajectory design



## Available Aerodynamics Tools

- Computational Analysis Programming Interface – Tool for CAD interface
- CART 3-D – Inviscid computational fluid dynamics analysis package for conceptual and preliminary aerodynamic design
- Chimera Grid Tools – Toolbox for scriptable grid generation
- DAC – Direct Simulation Monte Carlo analysis code for rarified gas dynamics
- DEBRIS – Code for performing debris transport analysis
- DPLR – Hypersonic computational fluid dynamics solver
- FIELDVIEW – Tool for flow visualization of computational fluid dynamics solutions
- FIN-S – Navier-Stokes solver based on finite element method
- FREEMO – Free molecular aerodynamics engineering tool
- GRIDGEN – 3-D grid generator for complex geometries in a production environment
- GRIDPRO – Grid generation software
- OVERFLOW – Navier-Stokes computational fluid dynamics solver for structured grids
- RPM3D – Engineering tool for plume impingement effects (particularly heating)
- SNEWT – Newtonian aerodynamics engineering tool
- TECPLOT – 2-D and 3-D plotting and flow visualization package

We have developed customer-friendly agreements to streamline business relationships and are eager to share our unique facilities and expertise with new customers. We invite your inquiries regarding application or adaptation of our capabilities to satisfy your special requirements. Briefings on general or specific subjects of mutual interest can be arranged at JSC or at your business site.

**Facility Testing Information**
http://jsceng.nasa.gov

**Point of Contact**
Beth Fischer ● Associate Director ● JSC Engineering Directorate ● (281) 483-8991 ● beth.a.fischer@nasa.gov

FS-2011-07-019-JSC